

NASA TECH BRIEF

Langley Research Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Control Vane for Engine Exhaust Flow

A control vane for engine exhaust flow has been devised which completely solves the problem of hot-gas exhaust impingement on curved-duct exteriors, shielding, and other nearby structure components. This control vane was designed for use on helicopters with engine-exhaust emission through curved ducting rather than straight pipe. With the curved exhaust ducting, the secondary flow (swirl motion) combines with the free-stream flow in such a manner as to cause the hot exhaust gas to strike exterior structures and, in turn, heating and discoloring those surfaces.

Figure 1 shows the swirl motion and how the control vane, through a unique combination of free-stream flow turning and induced vortex flow, alters the characteristic exhaust flow pattern. To eliminate the secondary

egress of exhaust, which would otherwise mix with the free stream and cause detrimental impingement of exhaust flow on duct exterior or surrounding structure, the curved vane is placed upstream of the engine exhaust duct. It is placed in close proximity to the exhaust exit so that a free-stream flow more in line with the exit is induced. The core of the vortex, generated by the two squared-off tips of the vane, passes near the outboard edges of the exit and further strengthens the free-stream flow more in line with the exhaust exit. Figure 2 shows alternate control vane designs, one of which would be used in instances where secondary flow motion is much stronger at A, rather than B, because of interior duct design.

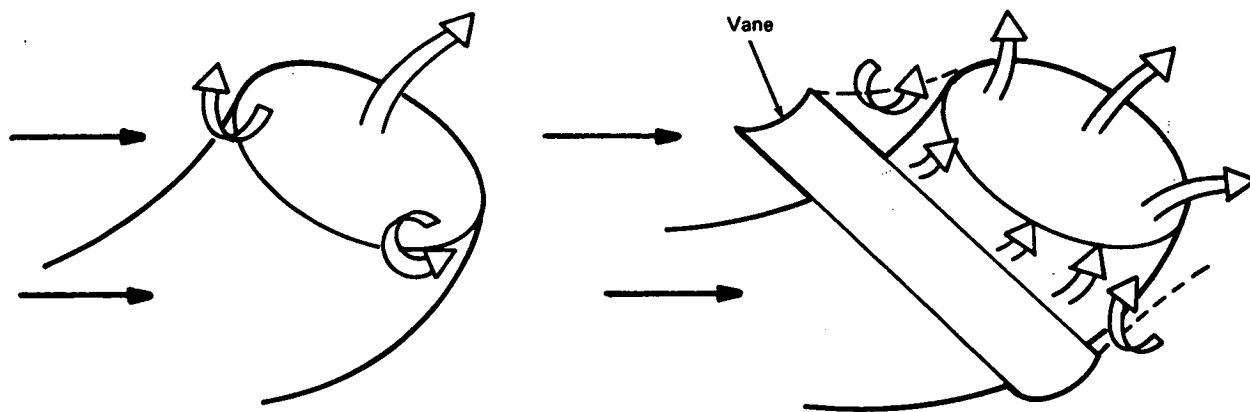


Figure 1. Control Vane With Curved Engine-Exhaust Ducting

(continued overleaf)

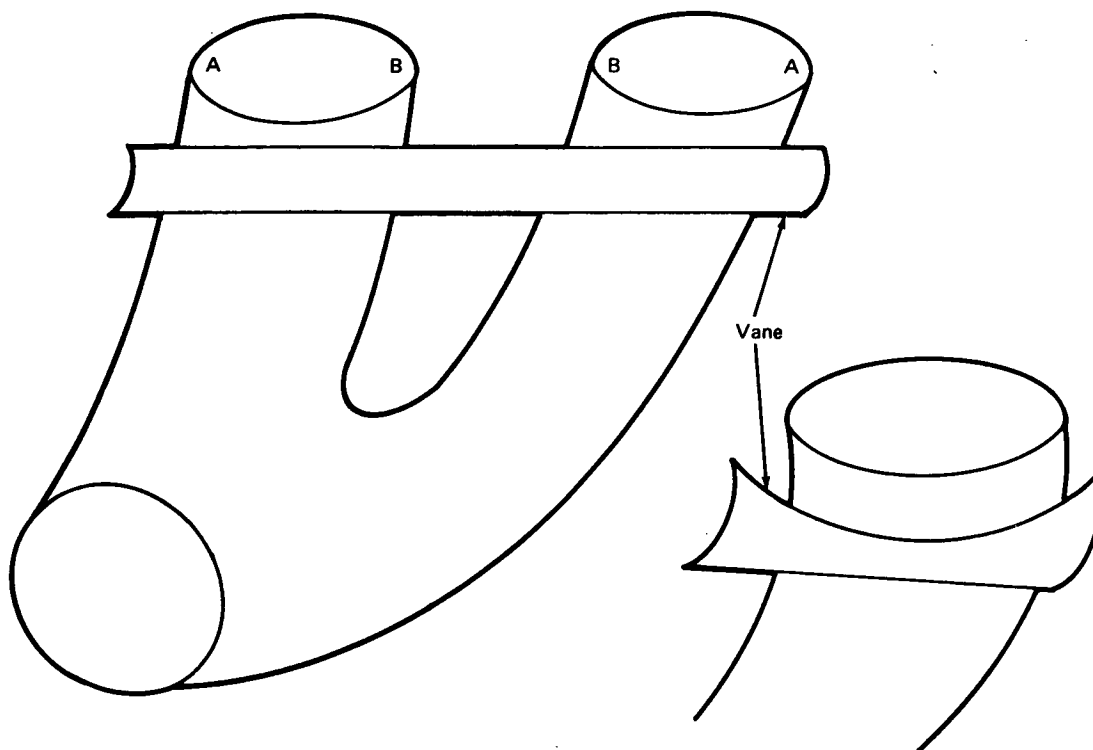


Figure 2. Alternate Control Vane Designs

Notes:

1. The following documentation may be obtained from:
 National Technical Information Service
 Springfield, Virginia 22151
 Single document price \$3.25
 (or microfiche \$1.45)
 Reference: NASA TM X-3016 (N74-17758). Wind-Tunnel Investigation of Simulated Helicopter Engine Exhaust Interacting With Windstream
2. Technical questions may be directed to:
 Technology Utilization Officer
 Langley Research Center
 Mail Stop 139-A
 Hampton, Virginia 23665
 Reference: B74-10138

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel
 Langley Research Center
 Mail Stop 456
 Hampton, Virginia 23665

Source: Craig S. Shaw and John C. Wilson
 (USAAMRDL – Langley Directorate)
 Langley Research Center
 (LAR-11570)